



Advanced Capabilities
(ADCAP) Mark-48 torpedo.
Department of Defense

FOREIGN MILITARY RESOURCE DEPENDENCY

Inevitable International Interdependency Undermines Tactical and Strategic Sustainment

Maj. William J. Norton, USAF

In 1982, Argentina was at war with Great Britain over possession of the Falkland Islands. The South American nation had only recently purchased 14 French Super Entendard aircraft and a like number of their AM.39 Exocet air-launched anti-ship missiles. However, only five of each were delivered by the onset of hostilities, and these were still being prepared for action.¹ The French, quite naturally, found it impolitic to deliver the remaining equipment for use against its neighbor, or to assist in its integration — all in breach of contract. The Argentines were then forced to cannibalize one of the aircraft to keep the others operational. The tremendous effect of the five Exocets on the Royal Navy task force (two ships hit and both sunk) demonstrated the significance of the French ability to deny Argentina additional missiles and launch aircraft. Had Argentina sunk a British aircraft carrier or other major warship, the Argentines may well have forced the United Kingdom (U.K.) to withdraw.

Past Experience

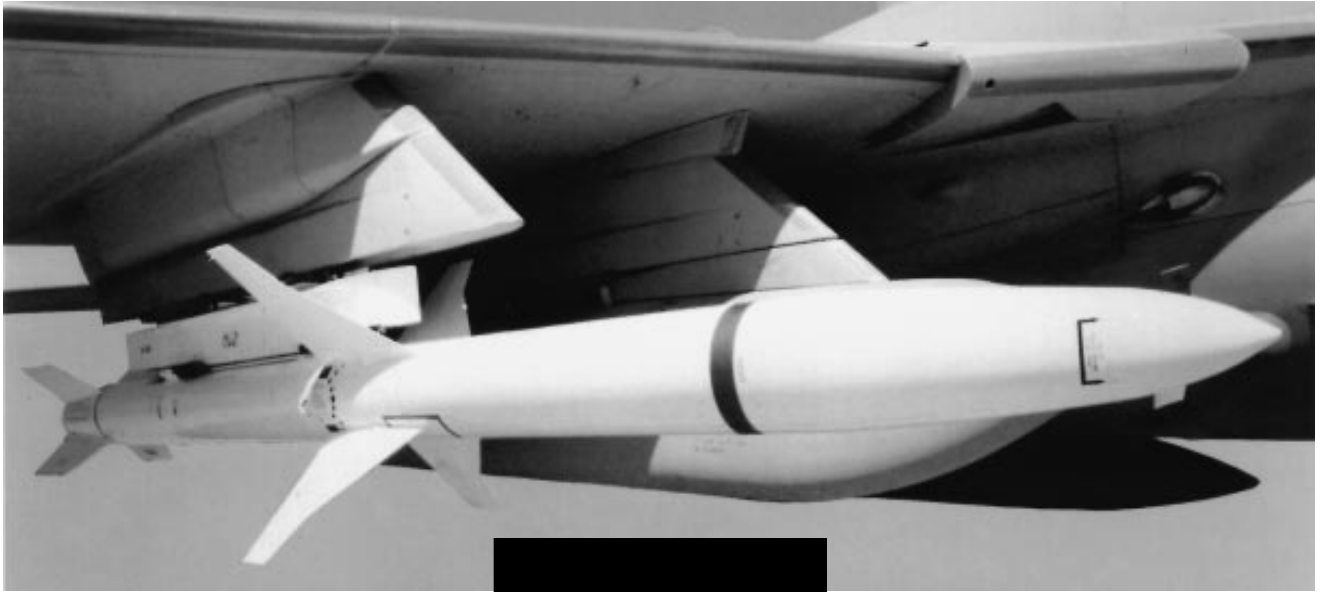
The Falklands experience shows the possible consequences of operating weapons not produced and sustained in one's own country. Familiarity with indigenous systems that many local personnel often possess, both in and out of uniform, is a distinct advantage. Manuals and equipment markings are in a familiar language. Connections and electrical requirements are interoperable with other equipment. Parts and supplies are unlikely to be immediately impacted by embargo or blockade. In addition, the manufacturers are readily accessible and generally motivated to assist their nation's forces in principle as well as for financial reward. This allows surge production and equipment modifications to be effected with greater ease. The events of 1982 also illustrate the more dire consequences of dependency on a foreign supplier of military resources. Yet, many more subtle aspects of the dependency are no less significant.

Few nations are large enough or wealthy enough to sustain a military industrial base for a complete range of weapon systems on their own. Even those that can will probably find that components of their weapons are dependent upon external sources for essential production elements and sustainment spares. Few suppliers of such complex end items as armored

vehicles, warships, or combat aircraft manufacture all elements of the product. Today, few if any American-supplied equipment items, especially electronic-intensive articles, are free of foreign parts. A diesel engine may be purchased from an American manufacturer, but certain specialized fasteners, gaskets, and filter material may be exclusively supplied by a foreign producer. Because of inventory expense, the American engine maker may have only a few days' supply of these items to keep the production line operating and to supply repair facilities. It then becomes the responsibility of the military operator of the vehicle powered by the engine to ensure that enough of these items, or parts that incorporate them, are available within organic supply channels to meet expected needs for some worse-case level of conflict.

Because of the vast number of such items, and the possibly unclear initial source of each, it becomes an exceptionally difficult logistics exercise to plan for such contingencies. Like the old adage of the war being lost for want of a shoe on the messenger's horse, a contemporary conflict may be lost for want of a foreign-produced O-ring for main battle tank engine fuel pumps. The program manager for the initial acquisition and later support of a weapon system can assist the user by identifying foreign resource depen-

Maj. Norton, USAF, is the Leader of the Aircraft Systems Team, Aircraft Systems Test Division, Arnold Engineering Development Center, Arnold Air Station, Tennessee. The author of numerous technical papers, magazine articles, and two books, he is a graduate of DSMC's PMC 95-1.



AGM-88A High Speed Anti Radar Missile (HARM), now in production for the U.S. Navy and Air Force.

dencies and reducing them as much as possible. This, however, is made difficult by complex and contradictory regulations and policy, the unexpected decisions of more influential government agencies, and the very nature of today's world economy.

Dimensions of the Problem

The economies and industries of the world's industrialized nations are irrevocably intertwined. It has become virtually impossible for these nations to maintain a completely independent military industrial base and supply system. Any comprehensive effort to eliminate foreign resources in weapons would be counterproductive to relations with international trading partners. Basic fiscal realities, the pressures of peacetime commerce, and the vast material needs of a modern military force have contributed to this complex system of international interdependency.

Buying products from foreign sources, even if assembled in the United States, also reduces the experience level of American engineers and scientists. This can hamper the development of future high-technology products, becoming especially troublesome when classified programs preclude active foreign involvement. The ability to keep up with and even

drive emerging technologies will be essential for leadership in developing the next generation of weapons.

Buying foreign technology or weapons also presents the potential for adversaries to obtain them as well, allowing them to acquire or deploy hostile countermeasures. Foreign resource dependency creates the possibility that critical items can be denied to a nation during a period of surge procurement in an emergency or mobilization for total war. These factors still remain very significant in determining the world balance of power. There are those who advise that the next war will be short, and that only what is possessed at the start will be significant. This view, however, holds the risk of preparing for the last war.

Tiers of Dependency

A weapon system can be dependent on foreign suppliers at many levels, referred to as tiers by many researchers.² At the bottom tier are basic

raw materials. Above this are refined or manufactured materials from which assembly elements are produced. Assembly elements on the next tier are bolts, gaskets, resistors, and similar piece parts. Components are then made up of assembly elements and general industrial supplies like adhesives and paints. Subassemblies such as engines, specialized digital processing units, gun sights and the like come next. Finally, complete end items constitute the top tier. The supplies to sustain the end item, probably falling under components or assembly elements, can become critical resources during lifetime support. Also readily identifiable at any of the tiers are manufacturing resources such as machine tools, industrial supplies, and manufacturing processes that are essential for production. Add to this considerations such as foreign controlling interest of a company, how much of the firm's financial vitality is determined in foreign markets, and how much the electrical power used in the manufacturing process is dependent on foreign oil, and the picture can become convoluted very quickly.

Examining the bottom tiers, it is simply impossible to meet all raw or refined material requirements for advanced weapon manufacturing with indigenous resources alone. While the

United States is still a resource-wealthy nation, even it does not possess natural deposits of all raw materials required for modern armament production. Many strategic materials, such as chromium, are essential elements in weapon systems manufacturing processes, yet are only available to the United States via importation. Most countries have fewer natural resources to draw upon. The availability of these domestic materials can also be dictated by the market and competition. The best that any country can do is to subsidize its own strategic industries and maintain a strategic reserve of such resources to meet the needs of a conflict — the length and intensity of which would be predicted by analysis. Subsidies and strategic reserves are expensive to maintain, and reserves simply cannot meet all requirements of material type, quantity, and quality. Efforts to rapidly expand such reserves are difficult to conceal, and can serve as a warning to a potential adversary of impending military action.

The most apparent and significant raw material dependency is crude oil. Many nations are dependent on foreign sources of oil to fuel their industries, meet consumer demand, and supply their military. The United States still possesses a sizable natural reserve of oil, but it is becoming very expensive to extract and is of relatively low quality. The high-quality light crude required by many industries can only be economically obtained overseas. As a result of the Middle East oil embargo of 1973, most nations built up a strategic reserve of oil to see them through similar circumstances in the future. The size of these reserves may or may not be adequate, depending upon future circumstances. The Middle East war that prompted the embargo could well have sparked a major war in Europe. The embargo would then have placed the West at a potentially catastrophic disadvantage.

Looking at the manufacturing tiers more broadly, program managers may

find that their systems are dependent on foreign suppliers due to a number of complex factors. As with raw materials, there may simply be no domestic source for the required item or process. Perhaps domestic sources cannot fully meet requirements or are not competitive in terms of quantity, quality, price, delivery terms, or general product performance. This may be due to such factors as wage rates, taxes, commerce restrictions, and environmental regulations. Foreign-held patents may also dictate the use of non-domestic resources. Foreign articles may offer the best technology and processes to solve design problems. Where non-developmental items are used, foreign dependency may simply be an inherent feature of the items. The use of a foreign supplier may also be a national policy-motivated directive. This can include measures to improve equipment commonality with allies, a decision to buy a foreign item to meet a political end, or part of an offset agreement with a foreign government.

Why Does Domestic Manufacturing Atrophy?

The following paragraphs lend insight into some of the reasons why domestic manufacturing capabilities atrophy. For many unique elements and components, it may simply not be economical for an indigenous manufacturing capability to support local military needs. The manufacturers of such supplies must frequently have a considerable commercial market for their products to justify the cost of production. In more and more cases, the military market has become economically unable to dictate availability or volume of unique products. With today's shrinking defense expenditures, a pervading concern is that the military cannot influence suppliers to retain a surge or reconstitution production capability, thus affecting our nation's ability to respond to wartime exigencies. Local suppliers of critical resources may require substantial subsidies from the government to sustain production of unique items or main-

tain excess capacity. In the United States, examples abound of systems and major weapons being procured (the Seawolf submarine as an example) for the sole purpose of retaining an industrial base to meet future emergency requirements. These constitute an extremely expensive form of subsidy, which probably cannot be continued indefinitely owing to constrained fiscal conditions.

The possibility that a required item will simply go out of production should be addressed by the program manager. This issue is complicated by foreign dependency. The risk of production termination grows as weapon system lives are stretched, while technology continues to advance at a more rapid pace. It then becomes economically impractical for manufacturers to continue producing an outdated item for a single customer. Even a customer as large as the U.S. military can no longer dominate many technological fields nor command the direction of development and production. This effect will only grow as the military adapts more commercial products. These items tend to have a shorter technological life than military systems and, driven by the commercial market, may be rendered insupportable as production lines turn over. It also becomes financially impractical for the government to subsidize the production of certain items when a more lucrative commercial market demands all of a manufacturer's production capacity. Again, the program manager may pay for excess production capacity to meet these contingencies, but the pressures to reduce system development and production costs will restrict this to only the most critical components and subassemblies, if any at all. Highly probable is the possibility that these critical components are, in turn, dependent on lower-tier resources that cannot meet an accelerated production pace.

Beyond basic contractual terms, how the U.S. government can influence foreign suppliers to meet recon-

stitution or surge requirements remains unclear. Even more worrisome, foreign resource denial can occur during wartime or periods of heightened tension. Delivery of supplies may be suspended through coercion, by the policy of a supplier's government (hostility, neutrality, change of alliances, etc.), or by conscientious choice. Supplies may be interrupted by political unrest and labor strife in the supplier nation. Of course, natural causes (storms, earthquakes, etc.) may also prevent delivery. The possibility of a natural supply interruption is increased by the distance the product must travel during delivery. Also, an embargo or blockade, internationally sponsored or otherwise, can interrupt supplies. More drastic yet, the enemy may take active measures to divert or destroy supplies enroute.

What Can Be Done?

The measures a program manager can take to reduce the impact of foreign resource denial begin with identifying the origin of all resources used to manufacture and sustain the weapon system. This may not be an easy task since research has demonstrated that even prime and subcontractors are frequently unaware of the origin of resources at any but the upper two or three tiers. With this information, and

with assistance from other government agencies, the program manager can determine the likelihood that foreign suppliers will continue deliveries, come what may. This is naturally dependent on an examination of indi-



F/A-18A Hornet aircraft aboard the nuclear-powered aircraft carrier U.S.S. Dwight D. Eisenhower (CVN-69) during Fleet Exercise '90.

vidual foreign suppliers, the laws under which they operate, the policies of their governments, and the general character and attitude of those governments. Where this examination reveals a supplier of questionable constancy, alternative sources can be sought or design options and alternative technologies may be developed to eliminate the dependency. Contractual vehicles to develop a second source for critical items can help create a domestic supplier or at least reduce the impact of a loss of deliveries from a single source. When many critical items are found to originate from a single country or region, it may be wise to make efforts to find more widespread sources to reduce

the impact of interrupted deliveries from this one area.

The measures just described are understandably difficult to enact under the current conditions of marginal manpower and fiscal resources. With system cost and affordability now of primary importance in weapon system development, it becomes less likely that cost increases associated with eliminating foreign dependencies will be found acceptable. The program manager is assisted by the Commanders' in Chief Critical Items List and the Defense Key Technologies List in identifying items that are already recog-

nized as critical. In individual cases, it may be necessary for senior leadership to make a determination of how critical the system is to the nation's defense, and how significant an interruption of foreign resources to support it will be in both the short term and long term. This permits an educated trade-off of cost and system vulnerability. As pointed out earlier, developing weapons that require only indigenous support is almost impossible given the current interdependency of the world's economies. However, only the investigation of options and their cost impact can show what *is* possible. At the very least, the program manager should attempt to document all dependencies. The program office logistician can then work to ensure that items vulnerable to supply interruption are procured in sufficient numbers and frequency to meet the most likely surge or wartime contingencies. A recommendation for stockpiling the most vulnerable resource can also be made.

On a national diplomacy level, the government can also assist in ensuring a continued supply of required foreign resources. The government can take measures to sustain active or inactive alternate sources, domestic or foreign, which are judged to be dependable suppliers in emergencies. Diplomats can help to ensure that supplier nations remain dependable trading partners regardless of U.S. foreign policy, or can issue warnings when continued deliveries appear to be at risk. Another consideration where statecraft comes into play is the retention of sufficient political clout to ensure the continued flow of foreign resources or the retention of allies who can provide alternatives. In concert with this, the government must have adequate fiscal resources (cash and credit) to obtain alternative components or end items from these allies. Finally, the nation must have the military might to break blockades by force to ensure an unhindered flow of international commerce.

Law, Regulations, and Policy

While most will admit the desirability of having armed forces free of foreign resource dependency from a warfighting perspective, U.S. policy generally reflects more fundamental economic realities. The Buy American Act, conceived more than 60 years ago to ensure that the government buys only from domestic suppliers, has been largely overcome by a changing world. Not only must government agencies comply with the terms of the Act, but contractors and their subcontractors/vendors must also comply. The Act has been applied all across the spectrum of manufacturing tiers, but is today most often limited to end items or major components. Buy American has also been undercut substantially by contemporary international agreements. Current exemptions include certain defense procurements, and many allied nations are exempt from its exclusionary provisions.

More detailed guidelines and exemptions are embodied in the Agreement on Government Procurement and the Trade Agreements Act of 1979. In an effort to address trade imbalances and the eroding military industrial base, Section 232 of the Trade Expansion Act allows U.S. firms to petition the government to restrict imports when they will adversely impact domestic production capacity or national security. The Defense Production Act also authorizes the use of incentives to reinforce the domestic industrial base. However, other legislation and directives, plus the admonishment to seek affordable systems, present the program manager with conflicting pressures. The 1985 Quayle and Nunn Amendments to the Arms Export Control Act of 1976 encourage cooperative research and development projects with U.S. allies, waiving some procurement laws to facilitate this. The DoD regulations list five prioritized material alternatives to meeting a military requirement.³ The second and third alternatives are the purchase of existing

commercial or allied systems and a cooperative development program with allied nations, respectively. The government's international policy, offset agreements, and treaties can also affect military procurement activities. Thus, economic and political motivators have overridden the operational rationale of avoiding foreign military resource dependency, in many cases encouraging it as a byproduct of activities in pursuit of other national objectives.

For major defense programs, regulations require program managers to provide, in Annex C of the Acquisition Strategy Report, an analysis of the industrial base necessary to produce and support their system in an efficient and cost-effective manner.⁴ The analysis must specifically identify items that can only be obtained outside the national base, alternatives for obtaining the item within the base, and the vulnerability posed by reliance on an outside source. It should also address the likelihood that the industrial base can or will continue to produce critical resources for the life of the weapon system. Unfortunately, there is no requirement for this analysis to go below the top two or three manufacturing tiers. Also, no established criteria determines when a system is overly dependent on foreign resources. In addition, the implications for peacetime support, contingency support, and reconstitution objectives are issues to be considered at each milestone decision point. These requirements clearly presuppose a strong potential for foreign elements in U.S. weapon systems. Concern has also been expressed about American firms that have been acquired by foreign entities. Regulations prohibit award of a defense contract to a firm controlled by a foreign entity if the program requires that the firm be allowed access to a proscribed category of information.⁵

Acquisition Examples

In a study of three U.S. Navy weapons (HARM missile, Verdin commu-

nications system, Mark-48 ADCAP torpedo),⁶ it was found that 5 percent of the companies supplying the prime contractors of these weapons was foreign, yet they supplied as much as 40 percent of the value of the systems. Furthermore, 2 to 3 percent of the total value of the weapons was supplied by domestically located but foreign-owned firms. While the study found that the National Defense Stockpile contained inventories of each of the foreign-supplied raw materials for which the weapons were dependent, in some cases they were of insufficient quality to meet the manufacturers' needs. While the majority of the foreign suppliers were longstanding friends of the United States, like any nation their first priority is their own welfare. Circumstances could influence their willingness or ability to supply the United States in an emergency. During the 1990-91 Persian Gulf conflict, the Japanese Diet and the Swiss Parliament were required by their laws to vote on whether their country would supply the United States and its allies. Had some circumstances been different, they may well have decided to remain strictly neutral. More to the point, the U.S. did make an effort to significantly increase the production rate of some expendable items during the conflict, but found that the availability of foreign parts was a pacing consideration.⁷

The following is an example of how a program manager may be the recipient of "help" in the area of foreign resource dependency.⁸ In the Fiscal Year 1983 Appropriations Act, the source of the ejection seat for the U.S. Navy's F/A-18 aircraft was specifically restricted to American suppliers. This was the result of lobbying by a domestic ejection seat manufacturer, urging the insertion of the Buy American restriction into the legislation. This was aimed at excluding a major British supplier from competing, and one with which the Navy had a long and rewarding business association. The effect was to greatly enhance the American

firm's chances of winning the contract. The Navy and the British Government protested the restriction on several points. Both noted that it contradicted an existing policy, presented in the Fiscal Year 1977 Defense Authorization Act, for enhancing standardization and interoperability within NATO. It was also contrary to U.S. government agreements with NATO allies that guaranteed access to each other's defense markets. The Navy pointed out that the exclusion of certain manufacturers by law set a dangerous precedent of permitting congressional interference with a source selection. The restriction might hinder the benefits normally expected of competition, these being inducement to lower price and increased quality. The following year's Appropriations Act exempted from the restriction foreign suppliers whose nation allowed American access to their markets. As a result, the U.K. manufacturer won the ejection seat contract for the initial blocks of F/A-18 aircraft.

Come What May

Those defense industries that survived the recent downsizing are feeling great pressure as their local markets continue to dwindle. Even a wealthy nation like the United States cannot subsidize or even substantially influence all industries to create a completely independent military industrial infrastructure. The ability of the U.S. government—the single largest purchasing agent in the world—to influence critical industries to the benefit of its military procurement activities has eroded markedly because of the dominant commercial market. Nations are frequently finding it necessary to collaborate on the development of complex and expensive weapon systems to maintain some vestige of a latent indigenous military industry. This simultaneously creates a foreign military resource dependency and possible materiel denial, which is contrary to good strategic sense.

It has also become necessary to seek foreign markets for weapons to provide any semblance of an economical production run. The worst aspects of the "military industrial complex" may be seen as taking on a self-perpetuating international character. Although the U.S. limits the export of some technologies in deference to security concerns, this policy is not consistent. In a period of reduced tensions, commercial interests generally take the upper hand in this regard. This often creates the unpleasant situation of selling arms to unstable or aggressive regimes that the supplier nation may come into conflict with at a future date. The supplier nations can then find themselves facing the weapons they produced or at least the technologies they developed. In an effort to sustain their own military capabilities, a nation can place its armed forces at a disadvantage, while simultaneously sacrificing long-held principles and values.

Endnotes

1. Burden, Rodney A., Michael I. Draper, Douglas A. Rough, Colin R. Smith, and David L. Wilton, *Falklands: The Air War*, British Aviation Research Group, London, 1986, pp. 34-37.
2. *Industrial Base: Assessing the Risk of DoD's Foreign Dependence*, GAO/NSIAD-94-104, April 1994, p. 18.
3. DoDI 5000.2, Defense Acquisition Management Policies and Procedures, Part 1, 23 February 1991.
4. DoDI 5000.2, Part 5, Section E, and Defense Federal Acquisition Regulation Supplement (DFARS), Part 207.
5. DFARS, Subpart 209.1 and 225.702.
6. *National Security Assessment of the Domestic and Foreign Subcontractor Base: A Study of Three U.S. Navy Weapon Systems*, U.S. Department of Commerce, Bureau of Export Administration, Office of Industrial Resource Administration, Strategic Analysis Division, March 1992.
7. GAO/NSIAD-94-104, p. 6.
8. *Industrial Base: Significance of DoD's Foreign Dependence*, GAO/NSIAD-91-93, January 1991, p. 23.